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THE IDEA OF POSSIBILITY

THE idea of possibility has a variety of usages which are, however, mainly two, as follows: First, it sometimes alleges a peculiar predicate of reality, a quality through which the not yet existent may become so, and moreover become so indeterminately. 'This or that may happen; either is possible'; and it is implied that the realization of the particular alternative is not necessitated. Secondly, it expresses 'a certain combination of ignorance and assurance' with respect to the conditionate order of events. 'Such and such is possible since if definite conditions were realized it would follow as a consequence.' Whether these conditions are or will be facts we do not know.

In answer to the question, What does possibility fundamentally mean? these two interpretations are sharply distinguished and opposed to each other. Possibility, according to the first theory, is *real*, even though a particular possibility is not now an existing *fact*. Its true field is generally regarded as that of intelligent action, rarely as the whole sphere of change. The other uses of the term are held to be subordinate, and to lack a genuine application to reality; thus the completely conditioned is, strictly speaking, either actual or necessary according as it has or has not yet come to pass. The principal objections to this first theory are: (1) that it apparently turns intelligent progress into pure chance; (2) that it collects wholly heterogeneous facts under a single term; (3) that it does not explain how a proper usage could become so perverted as to lose its original significance. Nevertheless it prevails both as an unreasoned conviction of popular thought and as a feature of theological systems, especially of scholasticism. Whether it has an adequate logical and psychological basis remains to be seen.

The second interpretation is less spontaneous and more elaborate. Possibility, it declares, is a subjective matter which has no direct metaphysical significance whatever. It is a 'spurious' concept; or, as one writer puts it, the predicate is 'not found as such outside

our reflection.' This theory in its most finished form goes on to say, that in our dealings with hypothetical events we often lack complete insight into their conditions, where yet we find ourselves confronted with practical necessities or moved by habits of adaptation. In such cases we do not remain quiescent, but assume an attitude of greater or less confidence in the matter, the different degrees of alleged 'possibility' corresponding to the extent of our knowledge and ignorance. Being unable to justify a given judgment completely, we nevertheless attach to it a certain value which varies in different cases.

The basis of this interpretation is obviously psychological. In many, perhaps in most, instances when we use the idea of possibility, we are thinking of something which we do not surely *know*. That the accused is possibly innocent, that it may rain to-morrow, that the righteous may win immortality, these are matters which to a great extent lie beyond the range of our vision, and we are conscious of our present mental helplessness. We are also conscious that the mere admission of ignorance is unsatisfactory, and hence we make a kind of elementary volition or tentative acceptance, and declare that these things may be. Furthermore, there is in many cases the observable assurance, not only that the fact escapes us, but that it is in its own field necessarily settled. The bright planet in the evening sky may be Venus or Jupiter, but it is definitely one, and the 'possibility' that it may be either is purely subjective; this we do know. Therefore, from this point of view, possibility means what we find in our minds when we talk about possible things; and hence the term is readily defined through the very evident psychical characters which reveal themselves under introspective scrutiny, namely the characters of doubt, ignorance, and the habit of accepting, more or less fully, that which we can not or do not prove.

To this view we may raise several objections. In the first place the alleged system of elements[1] is unclear and inadequate: unclear because both 'ignorance' and 'assurance' contain difficulties presently to be specified; and inadequate because the combination of their proper meanings does not square with the peculiar idea of possibility. On these points the following criticism may be made:

[1] To state the 'meaning' of an idea is either (i) to point out the objects to which the idea refers, the *thing meant* or meaning in extension, or (ii) to enumerate the mental elements into which the idea may be analyzed, and of which the essential ones constitute the 'intension.' These two processes mutually imply each other, since, on the one hand, the indication of an object does not present it to our intelligence as meaning anything unless it is perceived to be the realization of those ideal elements into which the idea may be resolved, and, on the other hand, to speak in abstractions is not to enlighten unless those abstractions somehow direct us to the concrete thing meant.

The term 'ignorance' is ambiguous. Does it mean: (i) the *fact* of ignorance, the simple lack of apprehension; or (ii) the *consciousness* of ignorance, a positive 'I don't know'; or (iii) a subconscious dissatisfaction or feeling of helplessness, which does not rise above the 'threshold,' but colors the whole mental state? If the first, it is sufficient to remark that the fact of ignorance is not a mental fact, but the absence of one, and hence that it can not be regarded as an element of an idea. By loose usage of speech one might indeed say that the idea of possibility means ignorance in the sense that it arises therefrom; but this would not be the proper 'meaning,' and furthermore it would raise the question whether we predicate possibility because of ignorance, or are ignorant, in some cases at least, because possibility is real. Secondly, if the *consciousness* of ignorance is supposed to be a constituent of the idea of possibility, we observe that it is never present as such in that idea. The transition from 'It may be' to 'I don't know' is a distinct mental step. This fact, however, does not show that ignorance is not elementary, for the process of analysis often introduces a change of form into its products. It is, therefore, plausible that the idea in question contains some subconscious factor, some vague sense of ineptness, which may be precipitated by reflection as the consciousness of ignorance; and if this were true the above supposition would be justified. But is it true? In the assertion, 'It is possible for me to raise the window,' is there uncertainty about the matter? No consciousness of doubt comes to light; in fact I am quite sure that I shall not do so. To retort that I may be mistaken, is to miss the point, for, as has already been explained, the *fact* of ignorance is not a mental element. If there is a subconscious factor it remains concealed so persistently as to raise a suspicion as to its identity; or if it does emerge it appears as an inference rather than as the conscious expression of a vaguely felt incapacity. Hence in many cases, I am inclined to believe, the mind does not naturally tolerate the suggestion of ignorance as constituent, at least fundamentally, of the idea of possibility.

Equally unclear is the term 'assurance.' In this connection it can mean only (i) intellectual certainty, or (ii) an attitude primarily volitional but varying in strength with the extent of one's information as to its object, a disposition to act or to ignore. Neither meaning is finally satisfactory, however. It hardly needs to be pointed out that when we allege possibility we are not ordinarily certain of anything except that possibility itself. 'Our friend may recover from his illness.' Of what are we here assured? Not that a definite fact exists, but rather that it is *possible*. We know, it is true, that he has a sound constitution, and is under expert medical

care; and when we affirm his chance of recovery we do so on these grounds. But the idea of the possibility, as it appears in the particular proposition 'he may recover,' is not our certainty of these facts (and ignorance of others). Long practice has taught us to proceed from what we know and do not know to the affirmation of possibility, but this affirmation is more than a summarized restatement of such premises. It is indeed, and oftentimes primarily, a volitional attitude, and hence 'assurance,' in the second sense noted above, is not improperly regarded as a factor of the idea. This very assertion, however, implies that it can be translated into intellectual terms, since, strictly speaking, an element of an idea can only be ideal. What, then, in our 'assurance' do we actually cognize? Is it not our ability or willingness to treat the supposition as real? To illustrate: 'I can walk or ride down town to-day.' Here there is undoubtedly assurance, but it is a consciousness of power. 'The man with whom I have an appointment may be late.' Again we have a degree of assurance, but what we actually know is that we can entertain the idea of his lateness unobstructed. This is not to say that the idea of possibility is a distinct cognition of treating a hypothetical fact as though it were real, but rather that 'assurance' is shown by examination to consist of, or to contain, a dim consciousness of self-potency of some sort. If so, the idea of possibility deserves a further analysis before it is condemned as fictitious.

The assumption of the ignorance-theory, namely that all usages of the idea are logically homogeneous, is also questionable. For the idea has a complex history, its applications range over many fields; and, granted that a thread of common meaning runs throughout, it is yet supposable that the logical force may vary, so that the possibility which we predicate of the weather to-morrow may not be identical with that which marks a future deed of our own. If this were true it would be necessary to discover, first, the primary and fundamental usage, and, second, the principal variations therefrom, with their causes.

Finally, with respect to the conclusion that the idea is metaphysically unsound, we must feel astonishment that the impostor has flourished so vigorously in the development of thought. The presumption would naturally be that it corresponds directly to something real; and our brief examination of the element of 'assurance' inclines us in the same direction.

To summarize briefly: The theory states (1) that possibility always means the same thing; (2) that this meaning is a blending of ignorance and assurance concerning facts; (3) that it represents no genuine character of reality. We have found the first and third

of these propositions doubtful, and the second only partially true, since one of the alleged elements is not surely indispensable and the other appears remarkably like a cognition of possibility in a particular field, namely the self.

In attempting to solve the problem of the meaning of possibility a preliminary question to be answered is this: In what field of reality should we look for its fundamental type, *i. e.*, for the things, facts, events, originally called possible.

On this point there is reason for believing the region to be that of personal activity. In the first place, the most important possibilities of life are obviously those which belong to our own powers; and in the second place, those which inhere in the powers of other beings like us. This thought, familiarized by such proverbs as 'A man is master of his own fortunes,' has come to be a fundamental rule of conduct. Elementary in child-training because correlative with the lesson of obedience, it gathers weight throughout the whole period of education. Probably the same is also true phylogenetically, with the additional consideration that primitive man, regarding all nature as animate in manlike fashion, must needs reckon outer possibilities as belonging to capricious divinities and demons. This opinion is further supported by the etymology of the words 'possible' and 'may,' for the root meanings, signifying 'power' and 'make,' certainly seem to indicate definitely the type of experience which called for the terms; that is, unless these words have strangely changed their import they show that the 'possible' originally meant what a living being might do. Since the only alternative is the improbable supposition that these conceptions arose in connection with impersonal objects, we may fairly conclude that the first-hand experience which served as a basis for the idea or to which it was an adaptation was a self-experience.

If we have thus ascertained correctly the original 'extension' of the idea of possibility our problem becomes, What is its 'intension'? that is, What is one's mental content when he thinks of a thing-he-may-do?

The main outlines of meaning stand in fairly clear light.[2] They are: (1) the image of the deed, as performed by the thinker, and referred to the future; (2) the relating of this imaged performance to the present situation as it appears in consciousness in the form

[2] We must not allow ourselves to be misled by the fact that in actual thinking our ideas appear as mere fragments of imagery, of a 'symbolic' character. These scraps serve their purpose, but when a meaning is in doubt they give way to a precise, systematic arrangement of mental elements. Hence a 'logical' idea is a hypothetical mental state, which may be artificially produced and analyzed by deliberate introspection; its 'meaning' is the result of such analysis.

of (3) motor sensations. There is, in short, a synthesis of the proposal with a present awareness of activity. For example, when I say 'I can go for a walk,' I depict myself as on my way, and make therewith a slight, instantly inhibited muscular effort. Where the synthesis is interrupted by force of experience the project is pronounced impossible.

These are the principal analytic elements in the idea. It is unquestionable that nothing can be called possible unless it can be imagined in some form or other. Less obvious is the relating of this image to the present potency. It may indeed seem that the first imagination is sufficient; certainly it is often hard to detect anything else, so rapid is the procedure of thought. But a more deliberate inspection reveals in such experiences a further factor, a consciousness of doing something; and in many instances the incipient act is evident, even though it is immediately stifled. This suggestion of movement is the feature which distinguishes the idea of a possible deed from a mere image. Doubtless it is ordinarily subconscious, yet a painstaking scrutiny discovers it. Consider, as a simple illustration, the possibility of closing the door. What I find in my own mind is a visual image of the operation, connected with a faint intimation of contracting muscles. In this case the relation appears to be temporal—a sequence within a span of apprehension which constitutes a single idea. Such an interval, brief as it is, may nevertheless contain a disrupting element. Thus if I ask, 'Is it possible to see the other side of the moon?' I have a vague image of the farther surface, and an automatic adjustment of my visual organs as when I use a telescope. I can not connect these details, however, for the 'edge' of the disk stands in the way, and I have learned that this edge is always the same. Experience has therefore given it a negative significance sufficient to destroy the whole. My *effort to see* is frustrated and I answer, 'Impossible.' The project was killed for want of a *potestas* which is not mine.

It is by no means surprising that in most instances some of these elements practically elude observation. It is interesting to notice, however, that whereas inveterate habit tends to sink the criterion to a subconscious level, while on the other hand the novelty of the special proposal gives it greater prominence in consciousness, yet if the matter be doubtful there is invariably a resort to experimental activity. It is as though the self proceeded on the well-known principle that you can't tell whether a thing is possible until you actually *try*.

Psychologically, then, the predicate 'possible' as applied to our own deeds means a fluent imaginary transition between what is pro-

posed and our present condition. Hence the mainspring of the idea is the consciousness of beginning an operation which reaches beyond the present instant; *i. e.*, the cognition of self-activity is logically prior to the idea of possibility.

It remains to consider how this meaning might have been extended to other situations, and in the course of time altered. Probably several influences contributed to the result. In the first place, assuming that the idea appeared at a time when all natural objects were regarded as animate and all events as purposive, we can understand how the predicate 'possible' would be woven into the texture of all experience. Secondly, an event to which the predicate is attached becomes in consciousness a nucleus of associations, important among which is the feeling of doubt or of ignorance. The general principle of redintegration would lead us to expect that subsequent events which appeared doubtful would promptly be categorized as 'possible.' Hence a wider meaning of possibility would be the harmonious relation of any imaged content to a point of reference in reality. This last, indeed, often seems to be a mere suggestion of reality-in-general, so that any supposition not self-contradictory naturally possesses the predicate; and thus we get abstract logical possibility, *i. e.*, conceivability, or systematic imagination without inner contradiction. In brief, a kind of mental content originally derived from self-experience and modified according to familiar principles of association, comes to have the vague character of consistency with reality, and is summed up in the term possibility.

The connotation of personal effort is not completely lost, however, when the object of the idea is no longer regarded as animate. Perhaps in a majority of actual cases the 'possibility,' whatever it is, stands in close relation to our life, so that in considering it we are necessarily considering our own attitude toward it. This attitude is not a pure intellectual vision, but a practical attempt to deal with a new situation; it is volitional in character, and as such it involves motor adjustments the perception of which is a constituent of the whole idea. Furthermore, it is at least sometimes true that the absence of contradiction in an idea is felt as the ability to think persistently or progressively, so that here again is a personal characteristic. Altogether, I am inclined to believe that the element of perceived self-activity is generally essential to the idea of possibility.

We come finally to the metaphysical question, 'Is possibility real?' Two points are to be noted. First, in so far as the idea includes the personal feature just considered it refers to a real fact. The proposal regarded as future event, or the conception taken abstractly, is unreal; but each, in its relation to the self—and this relation is

more or less indispensable—involves a reference to a genuine item of reality. In some sense, therefore, possibility is real. Secondly, the problem of 'alternative possibles' is left open. Analysis of the idea of possibility does not inform us whether the execution is determined or undetermined. So, having marched up to the edge of a familiar battle-field, we may reasonably halt.

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BIOMETRY

IT is the history of all sciences that have been developed to any extent, that they pass from a period of superficial observations and speculations, through one of more careful investigation, to one in which all observations are recorded by means of numbers, and the speculations are based upon mathematical formulæ. In other words, while the expression, 'an exact science,' is, in a way, tautological, still it may fittingly be used to express the goal toward which all sciences are pushing; and their progress in that direction may be judged by the extent to which their students express their ideas in quantitative terms.

It is, at present, difficult to conceive of the science of astronomy, for example, apart from formulæ and figures. Physics and chemistry have passed from the purely qualitatively observational stage to the realms of calculus and algebra. And in the study of the evolution of living beings, it is a hopeful sign that its workers are no longer content to say that a given species varies in a certain *way,* but tell us *how much* it varies in that way. It is no longer sufficient to say that offspring, as a rule, are like the parents; but we must know how much like their parents they are. Natural selection seems to be a very important factor in evolution; but just how real a factor is it?

Large masses of individuals under certain conditions must be carefully measured, and their measurements plotted and compared with those of masses from other conditions. The numerous laws of variation which have been proposed need careful and accurate testing with the rule and balance, on populations from the field and the breeding room. "Whatever views we hold on selection, inheritance or fertility, we must ultimately turn to the mathematics of large numbers, to the theory of mass-phenomena, to interpret safely our observations. As we can not follow the growth of nations without statistics of birth, death, duration of life, marriage and fertility, so it is impossible to follow the changes of any type of life

without its vital statistics.''[1] It is with these vital statistics that the relatively new phase of investigation known as 'biometry' deals.

It is the study to which Darwin looked forward when he said,[2] ''The chief point, which I am, and have been for years, very anxious about, is to ascertain whether the *young* of our domestic breeds differ as much from each other as do their parents, and *I have no faith in anything short of actual measurements and the Rule of Three.*'' (The latter italics are mine.) Let us, then, consider, briefly, some of the work which has already been done along this line and the methods employed.

It seems to be generally true in physical as well as mental characters that mediocrity is the rule. If a group of individuals, taken at random from a given species, be arranged in subgroups on the basis of the varying magnitude of a certain character, it will usually be found that a great majority of these individuals fall in the classes but little removed from the middle value, while the extreme classes, *i. e.*, those having a value much greater or smaller than the middle value, contain but few individuals. When data of this sort are plotted in the manner which I will now describe we get the so-called *curve of frequencies.*

The various classes are arranged in their order of magnitude. Perpendiculars are erected on a horizontal line as a base. The lengths of these perpendiculars are proportional to the number of individuals in each of the classes, starting at the left with the class having the smallest magnitude of the character in question. The spaces between the perpendiculars should be equal, as should also the range of magnitude of each of the various classes. Now, when the tops of these perpendiculars are joined by a flowing line, we find we have a curve high in the middle (representing the large number of mediocre individuals) and tapering off at each end. For most measurements it will be found to be practically symmetrical about the class containing the largest number of individuals—the most 'fashionable' class, hence called the *mode.* This class closely corresponds to the average, or mean value of the character, and the curve itself may be represented by the formula,

$$y = \frac{n}{\sigma\sqrt{2\pi}}\, e^{-\frac{x^2}{2\sigma^2}}$$

which is the formula of the 'Normal Curve of Error,' first deduced by Gauss at the beginning of the last century. We may conceive that the reason so many biological measures conform to this 'law of probability' or 'error' is that among the countless agencies at work

[1] *Biometrica,* I., p. 3.

[2] *Life,* II., p. 51.

influencing the growth of a character there are as many favoring it as opposing it, and these, working in all possible combinations, give rise to a curve typical of such chance combinations. However, whatever the reason, the fact remains that this formula, or a modification of it, can be used to represent accurately the data at hand; and if this were all, it would still be of immense value. Let us see some of the things it tells us.

In the first place, it is important to determine the modes of the characters of various species at a given place and time, and compare them with similar modes observed at other places and times, in order to discover just how much evolution, if any, is going on and in what direction the species is moving.

We also have, in the shape of the curve, a measure of the variability of the organ, and can compare it with the variability of other organs, *e. g.*, to discover if secondary sexual characters are really extremely variable. When plotted on the same scale, the more variable character will give a low flat curve, while the less variable one will give a curve with short range, one in which most of the individuals are grouped in, or near, the modal class. The range is itself a measure of variability, but a very poor one. A much better one is the σ of the formula given above. It is the square root of the average of the squared departures from the mean in both directions; and is called the *standard deviation*.

But, although many measurements conform closely to this symmetrical unimodal type of curve, there are many interesting departures. The curves are often 'skew,' *i. e.*, there is a tendency to produce more individuals on one side of the mode than on the other. The chances are not equal that the favorable agencies will exactly counterbalance the unfavorable. Here we would *expect* a gradual shifting of the mode—the evolution of a species—in course of time; but, probably, time alone will tell what skewness actually does mean. It is sometimes so great—*e. g.*, in the case of the number of petals in buttercups—that there are absolutely no individuals on one side of the mode.

Again, the curve may have more than one mode. There are clearly two or more centers of stability. Does it mean that the species is splitting up? An interesting fact in this connection is that in the majority of cases where dimorphism has been investigated, the two halves are skew toward each other. There is need here for much further work.

But probably the most fruitful field of biometry is that of *correlation*. Davenport[3] defines correlated variation as 'such a relation between the magnitudes of two or more characters that any

[3] 'Statistical Methods,' 2 Ed., p. 42.

abmodality of the one is accompanied by a corresponding abmodality of the other or others.' He further states, that " the principles upon which the measure of correlated variation rests are these. When we take individuals at random we find that the mean magnitude of any character is equal to the mean magnitude of this character in the whole population. Deviation from the mean of the whole population in any lot of individuals implies a selection. If we select individuals on the basis of one character (A, called the *subject*), we select also any closely correlated character (B, called the *relative*)—*e. g.,* leg-length and stature. If perfectly correlated the index of admodolity[4] of any class of B will be as great as that of the corresponding class of A, or

$$\frac{\text{Index abmodality of relative class}}{\text{Index abmodality of subject class}} = 1.$$

"If there is no correlation, then whatever the value of the index of abmodality of the subject, that of the relative will be zero" (since the relative class is, in this case, random sampling) "and the coefficient of correlation will be

$$\frac{\text{Index of abmodality of relative class}}{\text{Index of abmodality of subject class}} = \frac{o}{m} = 0.$$

"The coefficient of correlation is represented in formulas by the letter *r*. We can not find the degree of correlation between two organs by measuring a single pair only; it is the correlation 'in the long run' which we must consider. Hence we must deal with masses and with averages."

This method is applicable not only to the study of the correlation of various characters—physical, physiological and psychological—as they occur in the same individual, but it has been widely used in the study of heredity as a measure of the likeness of offspring to ancestry, or the likeness between co-parentals. It furnishes a measure of the strength of assortative mating, for it tells us exactly how much more like its mate one of the pair tends to be than a random sample from the population. It has proved useful in medicine, also, *e. g.,* in investigating the relation between vaccination and immunity or recovery. There are many other ways in which it has, in the short past, been a valuable aid to research, and we confidently believe that the end is not yet.

Unfortunately, most of us, like the immortal Darwin, are 'muzzy . . . on proportion and chance.' It is extremely difficult to apply

[4] Index of abmodality $= \frac{x}{\sigma}$

the formulæ which the mathematicians have worked out, and still harder to understand them. But, undoubtedly, the reward is rich. It is not only that we thereby secure accurate data upon important questions. It is, furthermore, not a 'mere formal clothing of biological conceptions with mathematical symbols.' Such analysis tends to crystallize our notions and makes our conceptions more definite; it will open up new lines of thought, and carry us toward the ultimate goal of a complete understanding of the mechanics of evolution. As in all valuable lines of thought the pitfalls are many, but progress is certain. "Ignoramus; in hoc signo laboremus!"

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DISCUSSION

THE APPLICATION OF CALCULUS TO MENTAL PHENOMENA

IN one of Dr. Montague's recent publications on time perception it was pointed out that we can get a very simple expression for the 'specious present,' which was found to be $\frac{do}{ds}$, if we denote by o the objective and by s the subjective elements of a psychosis. The second derivative would determine the time flow. Without considering the important philosophical results of the theory we shall make the following observations about the method.

The author considers the ratio of the increments Δo and Δs, which occur in the time Δt, and the fraction $\frac{\Delta o}{\Delta s}$ is supposed to approach or attain the limit $\frac{do}{ds}$. It will be of some interest to see what suppositions this statement involves. First of all it is clear that we have to consider the limit of $\frac{\frac{\Delta o}{\Delta t}}{\frac{\Delta s}{\Delta t}}$, because o is not an explicit function of s. Though we know little or nothing about the sufficient conditions of differentiability, we can in this case readily indicate the following necessary conditions: (1) o and s must be continuous; (2) both must have a differential quotient with regard to t; (3) both differential quotients must be continuous; (4) $\frac{ds}{dt}$ must not be zero in the whole time interval under consid-

eration. It is hard to make those assumptions, when we know nothing about the character of the functions dealt with, especially since s is apparently discontinuous in many points and can not be submitted to the well-known tests.

It is evident that the author had in mind to measure a time period by its relation to a standard change and so to get rid of duration, but he did not see that the conditions of the problem became so much more complicated by the implicit relation of o and s. All these tacit presuppositions would have become clear if the author had assumed that o is an explicit function of s, but such a relation, of which we can get no idea, would never have been granted. The establishing of the indirect relation between o and s by introducing them as functions of time hides the difficulty but does not remove it.

An example will show to what kind of conclusions we come, if we accept the author's view. $\frac{do}{ds}$ varies with time and we may pick out two moments for which this ratio has the same value, as it is always possible because $\frac{do}{ds}$ is continuous and $\frac{d^2o}{d^2s}$ changes sign. The conditions of Rolle's theorem are fulfilled, since continuity of $\frac{do}{ds}$ and existence of the second derivative are supposed by the author, and therefore the second derivative vanishes at least once. The vanishing of $\frac{d^2o}{ds^2}$ is characteristic for the state of ennui and the first conditions are approximately fulfilled if one sits in a quiet room and recalls something. It follows that one must be bored before one can recall anything. Psychological laws of this kind can be deduced easily by every mathematician.

There is not the least doubt that the whole theory of functions could be applied to a psychology of this kind, but the question remains, whether the conclusions logically deduced from our system admit of a verification by experiment. If we consider it an important feature of experimental psychology, that to every implication of our system corresponds an empirical fact and—if possible—*vice versa,* we must renounce speculations about functions of which we know nothing.

Now supposing for a moment that there are no gaps and errors in the author's proof, could we deduce anything from his laws? Of course not. The function is totally unknown and we must measure empirically the value of $\frac{d^2o}{ds^2}$. It would be important to know the derivative if we could construct the function or if we could verify it in some other way, but as we can not we must con-

clude that the use of symbols of which the applicability is uncertain and the meaning too general is of little help in psychology.

Finally it may be mentioned that the interesting attempt to measure a time period by the ratio of a change occurring in it to a standard change also occurring in it fails, because this ratio is a number which becomes a time only when multiplied by a time unit. For such a standard we choose a certain amount of change in *o*, to which we refer as a standard, for instance the movement of a pendulum. One of the principal features of a standard is constancy, and measurement is impossible without it. We have therefore either a measurement which varies with time or our whole speculations about the specious present break down, because the differential quotient of a constant vanishes everywhere.

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REVIEWS AND ABSTRACTS OF LITERATURE

Some Peculiarities of Fluctuating and of Inaudible Sounds. KNIGHT DUNLAP. *Psychological Review,* Vol. XI., pp. 308–318.

The Effect of Stimuli upon the Traube-Hering Waves. C. E. GALLOWAY. *American Journal of Psychology,* Vol. XV., pp. 499–512.

The Effect of Closing the Eyes upon the Fluctuations of the Attention. BERTHA KILLEN. *American Journal of Psychology,* Vol. XV., pp. 512–514.

The last two of these articles can not well be discussed apart from a series of experiments that have been carried on under the general supervision of the reviewer, and it may therefore be well to take advantage of this opportunity to summarize the earlier results and the general theory which lead to the experiments and which they confirm and support.

This theory, first proposed by Dr. Slaughter in 1901, is, in outline, that the attention waves are related with two physiological rhythms, the rhythm of respiration and the rhythm of blood pressure or change in arterial volume variously known as the Traube-Hering or Sigmund Mayer waves. The evidence was direct. The stimulus appeared during the expansion of the blood-vessels and disappeared during their contraction. The correlation was confirmed by Bonser in ignorance of Dr. Slaughter's results, with the difference that he asserts that disappearance corresponds to expansion, appearance to contraction in volume. Study of his curves, however, indicates that usually the coincidence is not so direct, that the contraction usually begins during the period of appearance, and lasts well over into the time of disappearance. Further evidence is needed on this point, but it seems probable that the results are not so divergent as the verbal formulations would indicate.

Two facts have developed with reference to the influence of stimulations upon the attention waves. These were first formulated by Taylor. The length of the attention wave is affected, usually lengthened, and the ratio between the times of appearance and disappearance is altered. The first suggested at once the similar phenomena in pulse and respiration, and seemed at first sight to support Slaughter's theory. Mr. Galloway's experiments sought to determine whether stimuli did actually have an influence upon the length of the Traube-Hering waves. His results were that the stimuli used, both pleasant and unpleasant, strong and weak, had the effect of lengthening the waves in every instance for the individuals experimented upon. This is confirmatory of the theory so far as it goes, but it is still necessary to study the influence of the stimuli upon the attention and vaso-motor waves simultaneously.

Another bit of evidence of the same tenor is offered by Mr. Galloway's work in the fact that attention and vaso-motor waves have the same daily rhythm of changes in length. In addition it was found that the average length of the two waves was very nearly identical for three subjects, in spite of the fact that they were taken several months apart; for a fourth, the attention waves were approximately double the vaso-motor; and the fifth observer was of the respiratory type—his attention waves corresponded to the respiratory rhythm.

If we bring together the evidence so far accumulated as to the relation of attention and vaso-motor waves we find that they occur simultaneously, that both are influenced by stimuli and usually in the same direction, and that the lengths of the two waves are approximately identical for a given individual at the corresponding time of day.

The second influence of stimuli is touched upon in Miss Killen's paper. Mr. Taylor found that any stimulus tends to increase or decrease the ratio of appearance to disappearance. The result was confirmed in part by Heymans, in that electrical stimulation inhibited weak tones, and in a measure by the work of Wiersma and the reviewer on the attention wave in fatigue in so far as we may regard the ratio between periods of visibility and invisibility as an indication of the functional capacity of cortical cells.

Miss Killen reinvestigated a result, first obtained by Münsterberg and recently cited by Pace as an obstacle to a central explanation of the fluctuations—that closing the eyes at intervals during attention to minimal stimuli would make continuous what previously had been an intermittent sensation. Her investigations indicate that the result obtained by Münsterberg is not universal, but holds only for one type of individual under special conditions. What does happen is that the time of visibility is lengthened or diminished according to personal peculiarity—in one person it was increased, in another diminished and in a third was diminished during one part of the experiment and increased during another. Whether it is increased or diminished depends upon whether the stimulus from closing the eyes exercises reinforcing or inhibiting influence upon the cortical cells involved. The only case in which the fluctuations would disappear would be when the stimulus was near the limen

of fluctuation, and the observer one for whom closing the eyes was a reinforcement. This condition was obtained but once in the entire set of experiments. Miss Killen concludes, then, that the Münsterberg phenomenon can be more easily explained from the central than from the peripheral theory.

Two facts that must have an important bearing upon any theory of attention waves result from the investigation of Dr. Dunlap.

1. Interruption of a minimal sound during the period of disappearance was in more than half the cases correctly noticed by the observer. The sounds were given by tuning-fork and telephone, and could be easily interrupted by the experimenter. The experiments were extended to show that sounds which were inaudible when continuous could be heard at their beginning or cessation. It is noteworthy that the cessation attracted attention more often than the beginning. The author does not attempt any theory, but lets the facts stand for what they are worth. To the reviewer, however, they seem to make strongly for a central theory. Certainly if the peripheral connections were entirely broken there could be no consciousness of the interruption. The fact also suggests an explanation of Pace's observation that when a weak visual stimulus was interrupted during the period of invisibility an after-image could still be seen.

2. In direct contradiction to both Dr. Heinrich and Professor Titchener it was found that minimal pure tones fluctuated. Both tuning-forks and the singing flame were used as sources of sound, and each of five observers clearly noticed the fluctuations.

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Die Farbenempfindung der Netzhautperipherie bei Dunkeladaptation und konstanter subjectiver Helligkeit. WILHELM PETERS. *Archiv für die Gesamte Psychologie,* III., 4, 1904, S. 354–387.

This investigation is concerned with a determination of the relative sensitivity of the different regions of the retina to brightness and to saturation. Peters worked in the dark-room of the psychological laboratory at Leipzig, with a modified form of the Hellpach perimeter. His four stimuli—red, yellow, green and blue—were, like Hellpach's, built up by means of light transmitted through appropriate color filters.

The most prominent feature of Peters's results is their extreme irregularity. The author feels justified, however, in interpreting them to mean that the retinal surface is to be regarded as a tripartite structure, containing a semiperipheral zone upon which color-stimuli appear in lesser saturation than upon more central and more peripheral regions. This interposed zone of minimal saturation is said (*S.* 380) to extend in the great majority of cases, from 35° to 55°, but his tables (*S.* 370f.; 374–8) indicate that its position and extension are wholly fortuitous. Thus it may extend from 15° to 45°, from 15° to 55°, from 15° to 25°, from 25° to 35°, from 25° to 75°, or from 45° to 65°. On one half-meridian it occurred twice, at 15° and again at 65°; while in numerous instances it

did not have the breadth of extension claimed for it. Thus it occurred once, only at the point 55°; twice, only at 25°; seven times, only at 35°; five times, only at 45°; and in one third of his explorations it did not occur at all.

A similar irregularity characterizes Peters's determinations of brightness sensitivity. He attempts to express these results in a series of general laws (*S.* 369), but here again his statement of the case is at variance with his data. For instance, he assures us that with maximal luminosity of stimulus, red and yellow decrease, while green and blue increase in brightness, upon the paracentral regions. But of the two sets of curves upon which the former assertion is based, one (Fig. 9) shows a wholly different relation. Then too, we are told that after red and yellow have reached their minimum, there occurs a distinct increase of brightness upon more peripheral regions. But his curves contain no justification for such a statement. In short, it is impossible to find a general characterization for the results of this investigation excepting in terms of their irregularity and inconclusiveness.

What Peters has done is briefly this: He has explored the retina under varying conditions of fatigue. The initial stimulus of each series was applied to a rested region of the periphery. Subsequent stimulations were repeated without sufficient intervals of pause to allow the retina to recover from the effects of its previous stimulations. So that with the progressive advance of each series towards the fovea, fatigue phenomena occurred in increasing degree. In Peters's results the presence of fatigue is manifested not only by the diminution of saturation and of brightness, but by the appearance of the complementary color tone as well. Thus, he reports that upon regions where a moderate green stimulus normally excites the sensation of yellow, it appeared in various tones of blue; he found that red and yellow also appeared blue while blue appeared yellow. The results yielded by this method are necessarily irregular because the degree of fatigue induced was not constant throughout. Certain of these results—the complementary phenomena—he dismisses with the naïve remark that he is not interested in discovering whether they are due to contrast or to fatigue (*S.* 360); the remainder are made to do service as a measure of the relative sensitivity of the various regions of the *non-fatigued* retina. The net result of the whole investigation is a demonstration of the fact that with different degrees of retinal fatigue, fatigue phenomena occur in different degree.

A chief difference between the methods employed by Peters and by Hellpach consists in the different direction of progressive exploration in the two cases. Peters began his series at the periphery and worked in a centripetal direction, while Hellpach, in his final determinations, proceeded peripheralward from an intermediate region. It was inevitable, then, that the latter should find his zone of complementary colors at the periphery, and that the former should find his zone of complementariness and diminished sensitivity upon a more central region.

The paper under review is after all an improvement upon the previous investigations carried on in the same laboratory by Kirschmann and by

Hellpach, in that Peters recognizes the significance of luminosity of stimulus. It is to be hoped that he will repeat his determinations, employing a method which provides for uniformity of adaptation and for equality of color-value of stimuli. Moreover, it is to be mentioned that no investigation of this topic is complete which refuses to take into account the fact that certain colors do not change in tone in passing across the retina.

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A Factor in Mental Development. MARGARET FLOY WASHBURN. *Philosophical Review,* November, 1904.

"When we trace the development of mental life upward from the lowest forms of the animal kingdom, we are led to believe that the process has been marked chiefly by progress in two respects: first, advance in the power to discriminte among stimuli, and second, the rise, somewhere in the course of development, of the power to form 'free ideas' . . . It is the aim of the present paper to indicate how both these great gains of psychic evolution have been dependent in part at least upon one factor: the organism's growing power to react to stimuli not in immediate contact with the body."

In support of the first part of her thesis the author points to the fact that "stimuli such as light or sound, which can not directly and instantaneously affect the organism's life, are those which have given rise to the greatest number of qualitatively distinguishable sensations. The reason is that, since it is unnecessary for the organism to make . . . instant response to such stimuli, it is at liberty to spend its psychic energies on qualitative analysis. Time can be taken to find out what the stimuli are, because it is not so desperately necessary to discover where they are and act accordingly. . . . On the other hand, the two classes of sensations that illustrate clearly how qualitative discrimination may be swamped through the immediate need for local discrimination are touch sensations and, preëminently, sensations of pain. Here the stimulus . . . is where it may injure, or actually is injuring. Immediate motor response . . . is demanded; there is no time for qualitative investigation. To say that the contact senses have fewer qualities than sight and hearing because the variety of stimuli for sight and hearing is greater, is obviously to beg the question completely. There is as much variety in the chemical constitution of bodies as there is in the ether or air disturbances which they send to us."

In support of the second part of her thesis Professor Washburn urges that stimuli, which by reason of their immediate bearing upon the welfare of the organism are at once transformed into motor reactions, do not have time to make a very deep impress upon the brain. "But when the creature has developed a capacity to be affected by light and sound . . . then the current of energy sent by the stimulus into the nervous substance is not at once drained off, but may linger sufficiently long to produce whatever alteration, whatever impress upon sensory centers, is needful to insure their subsequent functioning as the basis

of a free image. Delayed reaction . . . is then the source of the image-forming power."

The general conception of the ultimate cognitive value of ideas as varying inversely with their immediate motor utility is of course by no means new, but the peculiar merit of this admirable paper seems to the present writer to lie in the fact that its author recognizes not merely the truth of the conception but also its vital importance for the understanding of mental evolution. The primary desideratum of any evolutionary theory is a principle which will allow for a perfectly continuous development of a series of fundamentally different species. Professor Washburn's theory meets this demand. For if we assume that every stimulus expends its energy partly in a motor discharge and partly in modifying a sensory center, we can at once recognize the possibility of two fundamentally different types of organism, in one of which the motor predominates over the sensory result of the stimulus, while in the other the sensory predominates over the motor. As the organism became more and more perfectly adjusted to its environment, its stimuli would be less needed for motor reactions, and would thus become more and more free to expend themselves in modifying the sensory centers, until a *critical point* would be reached in which the energy of the stimulus devoted to sensory modification would just equal the energy devoted to motor discharge. Organisms below this critical point would only possess 'intelligence' or the capacity to profit by *past* experience, but organisms which had passed beyond the critical point would possess 'reason' or the power to form free ideas depictive of the *future*. The difference of the two types of organism would be momentous and yet the evolution of one from the other would be continuous, for it would not directly involve any new factor, but only a change of emphasis in factors already present.

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The Soul—A Study of Past and Present Beliefs. L. D. ARNETT. *The American Journal of Psychology,* 1904, XV., pp. 121–200; 347–382.

This investigation was undertaken by the author, he says, to supply a lack of knowledge on his own part, and for the benefit of others similarly situated. In working toward this result it aims so to present the views of psychologists and of theologians that 'some definite understanding of the use of the term may at least be suggested.'

Primitive ideas of the soul are first considered. The study begins with an effort to get at the conditions that have given rise to this idea and the explanations offered to account for it. The word 'soul' as used by various peoples is dwelt upon. The soul has usually been associated with some animate form,—with the bird, butterfly, mouse, serpent, lizard, fish and other animals. Again it is identified with shadows, with portraits, and with one's image reflected in water or in a mirror. It is most frequently regarded as shadow, breath and wind, then as life, heart, echo, etc. Rarely is the soul believed to be a material object. Sometimes the individual is thought to have a plurality of souls. The

soul is located in the heart, in the brain, in the navel, in the blood, in the bones and in the breath. Mostly all tribes atttribute souls to animals; some to plants.

The conclusion of this section is that the primitive idea of the soul can be classed neither as psychological nor as philosophical. 'It is connected more or less with superstitious beliefs.' For the savage the soul probably means life but not mind.

In tracing the ideas of the soul in the Greek philosophers 'a general tendency toward idealism' is seen which reaches its culmination in Plato.

Next are considered theories of the soul classified as theological, philosophical and psychological. While these are to be distinguished they are by no means separable. The first considers the soul in its relation to a 'personal God'—the view of the church. Here 'modern thought tends toward an ethical interpretation of the soul.' The second views the soul in its relation to a world soul, or to the universe, or to the being of the world. The soul for the philosopher is similar in essence to the absolute being. As the conception of the absolute develops in the evolution of new sciences, so will our knowledge of the soul increase. 'The term soul is too large for any one science, each contributes its part to our knowledge of it.' The third or psychological theory defines the soul on a basis of mental phenomena. Here we have the genetic point of view. We have the biological soul, the phyletic soul, the individual inherited soul, the soul of personal consciousness, equaling 'the sum total of conscious reactions,' and the soul of attention representing a cross-section of consciousness. Under the conception of the evolution of soul-life we pass 'from subjective to objective psychology, from feelings to intellect.' Thus the soul may be described, but not defined.

In the above threefold classification, in less than fifty pages, the whole gamut of philosophers has been ranged through down to and including those whom we know *viva voce*.

A questionnaire shows that the soul to the great majority is a theological concept, to a few it is psychological, and to a very few philosophical. The present theological soul is largely the equivalent of 'the totality of a man's life.' 'Recent psychology presents a hostile attitude toward the idea' of a soul. The church, influencing thousands, is a much greater 'factor in molding ideas in regard to the soul' than psychology which reaches the few. For the average man the substance of the soul is found in the feelings. Theories of the self as presented by James, Marshall, Howison, Schiller, Bradley and Royce follow, showing a preference for self, due to its definiteness, over the word soul. The self is more the objective consciousness, while soul is both subjective and objective. The ideas of a soul and of an immortal being persist contemporaneously.

"Our study of the subject leads to the following definitions: for educated thoughtful people the soul probably represents an ethical ideal, in a general way this may be embodied in certain principles, while the majority of Christian people refer to an undefinable mass of feelings."

YALE UNIVERSITY. HERBERT MARTIN.

Truth and Imagination in Religion. RALPH BARTON PERRY. *International Journal of Ethics,* October, 1904, pp. 64–82.

Modern interest in the psychology of religion is beginning to bear fruit, not only in that special field, but also in that of the philosophy of religion. It is true that these psychological results are sometimes substituted for a critical examination of the worth of religious beliefs, but it is also true that they serve to call attention to the nature of these beliefs themselves and thus to indicate the true starting-point for a philosophy of religion. There is a growing recognition of the very apparent principle that an understanding of the religious demands must precede a discussion of the grounds of belief in the possibility of their satisfaction, and that proofs of the existence of God presuppose a knowledge of what religion means by the term. This we find emphasized in the recent book of Professor Knox, in the theological chapters of Professor Fullerton's 'Metaphysics,' and this article of Dr. Perry, the aim of which is to call attention to the distinction between the imaginative elements in religion and those which claim objective validity.

Religion is essentially the sense of a practical situation and, as such, its judgments are practical, having reference to the adjustment of action to meet the conditions of this situation. Hence the religious attitude may remain unchanged in spite of change in scientific conceptions. The religious conception of God refers to the attitude toward man of his residual or total environment, and his religion involves an idea of his own best interests, of this disposition of reality toward him, and of the best means of adjustment in view of these facts. Theoretical truth has significance for religion only in so far as it bears on one of these elements. However science may come to think of the world and however much our conduct may be altered to suit this new conception, it will still remain true that some adjustment to this total environment will be necessary. The system of practical judgments expressing this adjustment will constitute the body of religious truth.

But religion, as concerned with life, is concrete, hence the function of the religious imagination in presenting truth in poetic form. The test of such imaginative forms is not that of objective accuracy and definiteness, but of fitness for the conveyance of practical truth—for presenting the religious reality in life. The content of these ideas will be the attitude of reality toward us, the significance which it has both in nature and in history. So, too, our sense of this attitude toward us will naturally call forth the expression of our own emotion in prayer and worship. How much of the content of religious ideas is imagination must, of course, be determined by reference to their intended use in any individual case, the basis of distinction being whether they influence the nature of the adjustment or affect only the vitality of the truth. Whatever determines our expectancies is meant for truth. What is poetry to one is deepest reality for another, the firm beliefs of the savage becoming the poetry of the later age, and the poetry of the religious genius being embodied in the creed of his prosaic followers. So with the idea of

personality, in that religion is always our response to the conceived attitude of reality to us, there is always a basis for the characterization of God as personal, but the degree to which this term implies human attributes is a matter of individual intention. Every religion holds more beliefs than it attempts to justify and rests in last resort upon individual experience.

NORMAN WILDE.

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JOURNALS AND NEW BOOKS

THE MONIST. October, 1904. Vol. XIV., No. 5. *The Origin of Species by Mutation* (pp. 641–671): J. ARTHUR HARRIS.–An elaborate survey of the comparative evidence for the inadequacy of the selective theory of the origin of species. Importance is attached to the alleged fact that variation by selection is purely linear or quantitative, increasing or diminishing given characters, rather than providing new ones. The varieties thus derived differ from true species in always tending to revert, on the removal of the selective agencies. *The Christ of Primitive Christian Faith in the Light of Religio-Historical Criticism* (pp. 672–710): OTTO PFLEIDERER.–In the preceding number of *The Monist* the author showed the parallelism of the stories of Christ's conception, birth and life to similar stories in pagan religion. In the present article he treats in the same way the Christian dogmas of Atonement, Sacramental Purification and Resurrection. The most striking, though by no means the only parallel to this trio of myths, is to be found in the Egyptian story of Osiris and Horus. *Paul Rée, An Obituary Tribute* (pp. 711–732): HENRY HOOPER.–A most interesting account of Dr. Rée's philosophical system, especially the parts of it dealing with the origin of conscience in the race and the individual, and with the controversy of realism and idealism. Dr. Rée seems to have been more nearly in sympathy with Hume and with Schopenhauer than with any other philosophers. *The 'Holy Edict' of K'ang-Hi* (pp. 733–746): EDITOR.–The sixteen sacred maxims of K'ang-Hi are here given in English and Chinese, together with the amplifications of them by his son Yung Chin, and explanatory and critical comments by the author. Criticisms and Discussions: *'Humanism'* (pp. 747–752): A. W. MOORE.–A brief sympathetic exposition and criticism of Mr. Schiller's book. *The Religious Experience* (pp. 752–766): RALPH BARTON PERRY.–"My religion is my *sense of the disposition* of the universe to myself." *Definition of Religion* (pp. 766–770): P. C.–"The characteristic feature of religion is conviction, and its contents a world conception which serves for the regulation of conduct." *The Basle Congress for the History of Religion. The Free-Thought Congress at Rome. The Congress of Arts and Science at St. Louis* (pp. 770–783): P. C. *Paul Rée—Obituary. Mrs. Annie Besant and the Theosophical Society. Book Reviews:* Hugo De Vries, *Die Mutationstheories:* P. C. Chilperic Edwards, *The Hamarubai*

Code and the Sinaitic Legislation: ANON. Iriving King, *The Psychology of Child Development:* ANON. Edward L. Thorndike, *Educational Psychology:* ANON. Hiram Vrooman, *The Federation of Religions:* ANON. Orlando J. Smith, *Balance, The Fundamental Verity:* ANON.

MIND. October, 1904. N. S., No. 52. *Humanism and Truth* (pp. 457–475): WILLIAM JAMES. – The author, after showing that many of the criticisms of humanism are irrelevant, proceeds to an exposition and defence of the movement. The results are recapitulated at the end of the article under seven heads, constituting a brief and acceptable *credo* of humanism. *Mind and Body in Recent Psychology* (pp. 476–508): A. E. TAYLOR. – The author criticises the parallelistic views of Stout, Ebbinghaus and Münsterberg, and tries to show that the mechanical is not opposed to the teleological but is a lower or limiting type of it, developed from it as habit is developed from volition. *Meinong's Theory of Complexes and Assumptions* (pp. 509–524): B. RUSSELL. – Five theories of knowledge which bear on the question whether what is asserted in a judgment—especially in a false judgment—exists in any way beyond the judgment. The author believes that the relation asserted in a true judgment unquestionably transcends that judgment, but hesitates to agree with Mr. G. E. Moore in holding to the real objective existence of what is asserted by false judgments. *In defence of Humanism* (pp. 525–542): F. C. S. SCHILLER. – The author discusses Mr. Bradley's article on *Truth and Practice* which appeared in the preceding number of *Mind.* He complains that Mr. Bradley's criticism of humanism is irrelevant and full of misunderstandings. *Fresh Light on Molyneux' Problem* (pp. 543–554): T. K. ABBOTT. – The author discusses various cases in which people formerly blind have on gaining their sight been able to distinguish between figures by the new sense. The case of Dr. Ramsay's patient, Carruth, is most fully treated, and the author feels that this case, particularly, justifies the belief that visual and tactual perceptions of figures have resemblance that is intrinsic and prior to all association. Critical Notices. A. E. Taylor, *Elements of Metaphysics:* J. S. MACKENZIE. Herbert Spencer, *An Autobiography:* F. C. S. SCHILLER. E. A. Kirkpatrick, *Fundamentals of Child Study:* J. EDGAR. New Books. Philosophical Periodicals. Notes and Correspondence (Letters by Norman Smith, A. Sidgwick and H. Rashdall).

REVUE DE PHILOSOPHIE. November, 1904. *La Notion de Hazard chez Cournot* (pp. 497–515): G. TARDE. – Cournot in the *Essai sur les Fondements de nos Connaissances* defined a fortuitous event as the result of the combination of several independent causal series. But such independence is a matter of degree always, never complete; often it is a close dependence. *Aristote et Platon suivant Zeller* (pp. 516–534): J. BULLIOT. – Zeller's treatment, following a Hegelian model as it does, arbitrarily discriminates various aspects of the Socratic, Platonic and Aristotelian systems, considering that as essential which fits best the Hegelian scheme. In particular, Socrates' use of concepts is wrongly

interpreted as idealistic (*à suivre*). *La Theorie Physique, son Objet et sa Structure* (pp. 535–562): P. DUHEM. – Primary qualities or properties are not essentially irreducible but only as yet unreduced. Elements are provisional. A mathematical account of facts is inadequate, indeed, an infinity of accounts pertains to a single situation; each is useful according to the accuracy needed in the result. None is ever entirely useless however. We must not overlook the significance of the approximate. *II^e Congrès International de Philosophie* (pp. 563–630): E. P. and J. B. *III^e Congrès International d'Histoire des Sciences* (pp. 631–636): F. M. *Congrès de la British Association for the Advancement of Science* (pp. 637–669): N. VASCHIDE. Sommaire des Revues. Bulletin de l'Enseignement philosophique. Cours de M. Lévy-Bruhl. Cours de M. Peillaube.

Bolzmann, L. *Vorlesungen über die Prinzipe der Mechanik.* Leipzig: Barth. 1904. 8vo. 9 m.

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Cave, R. K. *The Platonic Conception of Immortality and its Connection with the Theory of the Ideas.* Cambridge Univ. Press. 1904. 8vo. 5s.

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NOTES AND NEWS

THE American Philosophical Association and the American Psychological Association met at the University of Pennsylvania, in Philadelphia, December 28–30, in affiliation with the American Society of Naturalists and other societies meeting with the American Association for the Advancement of Science. Addresses were made by the retiring presidents, Professor Ladd addressing the Philosophical Association on 'The Mission of Philosophy,' and Professor James, the Psychological Association on 'The Nature of Activity.' Both associations joined in a smoker at the Colonnade Hotel on the evening of December 29. Officers for the ensuing year were elected as follows: For the Philosophical Association—President, Professor John Dewey, of Columbia University; Vice-president, Professor J. A. Leighton, of Hobart College; Secretary-Treasurer, Professor J. G. Hibben, of Princeton University; new members of the Executive Committee, Professor H. N. Gardiner, of Smith College, and Dr. R. B. Perry, of Harvard University. For the Psychological Association: President, Professor Mary Whiton Calkins, of Wellesley College; Secretary-Treasurer, Mr. W. H. Davis, of Lehigh University; new members of the Council, Professor G. M. Stratton, of Johns Hopkins University, and Professor Lightner Witmer, of the University of Pennsylvania. A detailed report of the meetings will be published in subsequent numbers of the JOURNAL.